NOTES ON FILM ENTITLED "GUNSMITH OF WILLIAMSBURG," with Wallace Gusler (Colonial Williamsburg Foundation, 1969)

I. Firing a flintlock rifle

II. Manufacture of barrel:

A. Material: wrought iron, starting with 3-inch skelp.

B. Forging the barrel:
--welding the skelp by hand/hammer;
--starts weld at middle and works toward ends;
--several hundred heats need to finish weld;
--annealing (slow cooling welded barrel in charcoal powder)

C. Boring barrel (by hand powered and controlled machine : no water or steam power used)
--a semi-mechanized operation (boring rod pushed through barrel by hand);
--12 to 15 rough boring bits used;
--bits frequently break and need to be repaired;
--gravity feed (using lead weight) used in later/lighter boring operations;
--straightening barrel (by eye and copper hammer)
--finish boring with square bit, using wood shims to enlarge bit (barrel pushed by hand through barrel).

D. Filing outer surface of barrel
--a long tedious process executed by hand and skill of eye;
--polished with emery paper (by hand).

E. Rifling barrel
--executed by machine, but powered by hand;
--note spiral guide on machine that imparts groove turns in barrel;
--cutter pulled through barrel;
--8 to 10 passes used in rifling, each with slightly larger shim to deepen cut of rifling bit in barrel.

F. Forging the breech plug and barrel tang (by hand).

G. Cutting/threading breech-plug screw (by hand).

H. Drilling touch hole with hand drill;

I. Barrel proof

--proof charge uses four times more gunpowder than regular guns.

--barrel inspected for cracks, etc. after proof **[a critical stage in the manufacturing process]**;

III. Manufacture of the lock or firing mechanism:

--the most complex part of a firearms (note irregular parts of tumbler, etc.);

--key parts: lockplate and cock + internal pieces (tumbler, bridle, sear);

--forging parts (hammer & anvil);

--each part requires 2 to 2.5 hours of filing;

--drilling lockplate (with hand drill);

--making exterior and interior screws for lock mechanism (by hand; no uniformity);

-filing interior components:

(1) tumbler

(2) sear

(3) bridle

--forging and filing frizzen (pan cover);

--forging main spring + two other smaller springs:

--material = steel, very tricky work requiring 3-4 heats

--filing and polishing springs;

--tempering springs in molten lead and quenching in linseed oil (heating springs to pale blue color and then quenching them);

--cutting notches in the tumbler (by hand filing);

--engraving the lock's exterior with "C" and "S" scrolls (by hand);

--case hardening lock parts:

(1) heating parts 5-6 hours in mixture of powdered charcoal, ground/charred bone, and charred leather in a crucible;

(2) heating them til red hot;

(3) quenching them in water.

IV. Manufacture of brass mountings (all by hand):

--casting process:

--preparing mould box

--two types of sand used: fine facing sand {around patterns} and coarse sand {in rest of mould box} plus parting powder (made of finely ground coal) between pattern and facing sand so that patterns can be more easily removed from the mould.

--removing patterns without breaking the mould;

--cutting "gates" into the mould (for pouring in molten brass);

--punching holes in mould with piece of straw so that air can escape from mould during casting process;

--pouring molten brass into mould;

--removing castings from mould, brushing, and cleaning them.

V. Making the wooden gun stock (all by hand):

--tools used: wooden mallet, saws, gouges, planes, chisels.
--1st operations: preparing "reference points":
    --bedding the barrel in the stock;
    --inletting place for breech-plug and tang;
    --drilling ramrod channel;
    --fitting butt plate.
--making wood screws (by hand);
--inletting stock for various iron and brass parts:
    --inletting & recessing stock for lock mechanism;
    --inletting & fitting brass side plate into stock (inlet w/ lamp black);
--engraving brass parts with V-shape engraving tool;
--forging, filing, and fitting trigger to stock (by hand);
--inletting brass trigger plate into stock;
--attaching barrel to stock:
    --making 4 brass pins (sometimes wedges are used) and loupes for holding barrel to stock (by hand);
--forging, fitting, and shaping brass patchbox to stock (by hand);
    --recessing stock for patch box;
--engraving brass patchbox with V-shaped engraving tool;
--making 3 thimbles for holding ramrod to stock (hand made of bent brass plate);
--making muzzle cap from one piece of brass plate (by hand);
--relief carving and inletting gun stock with "C" and "S" scrolls (all by hammer and chisel); "carving the stock slenderizes and gives the gun more grace."
--finishing stock with aqua-fortis (nitric acid + iron filings) + heat + several applications of linseed oil.
--installing sights (materials vary: brass, iron, ivory, bone);
--making bullet mold (each gun has its own peculiar caliber; no uniformity to speak of here; calibers are thus designated by the number of bullets that can be made from a pound of lead).

CONCLUSION:

(1) One master craftsman assisted by a journeyman or, possibly, an apprentice made the entire rifle. Skills involved: blacksmith, machinist, foundryman, woodworker, and engraver.
(2) Making one high quality rifle required over 300 hours of labor [1 rifle every 25 to 27 working days, a working day = 11-12 hours]. More than likely, the working day consisted of fewer hours [as few as 6 or 7]. In this case, it would have taken anywhere from 43 to 50 days to make a rifle of this quality.

QUESTIONS:

(1) Is this demonstration typical of the gunmaker's art circa. 1770-1800?

No. More divisions of labor existed in gunmaking to the extent that artisans frequently specialized in making only lock mechanisms and barrels. The typical gun maker circa. 1800 would more often than not have purchased these parts already finished and used

them in manufacturing the rest of the rifle, which is to say that he probably would have made the gunstock and brass parts and fitted everything together. To be sure, artisans possessed of Gusler's "complete" skills existed, but run-of-the-mill firearms were not made this way.

Examples: Silas Allen of Shrewsbury, Mass. (c. 1780s-1820s);
The Resor and Gumpf families of Lancaster, PA (c. 1770s-1830s);
John Armstrong of Emitsburg, Md.;
Marine T. Wickham of Emitsburg, Harpers Ferry, and Philadelphia (c. 1800-1835);
Simeon North of Middletown, Conn. (c. 1798-1850).

(2) The process of applying machinery and precision methods to gun making was incremental and cumulative in nature and lasted from c. 1798 well into the 1840s.
By 1850 at least three armories [and probably as many as five or six] possessed the size and technical capacity to mass product military muskets and rifles with unmarked interchangeable parts. The pioneers in the development of these methods were:

(1) Private gunmakers like Simeon North, John H. Hall, and Asa Waters [all New Englanders, by the way]; and
(2) public armories owned by the United States government and located at Springfield, Mass. and Harpers Ferry, Virginia (now West Virginia).

The first manufacturers to successfully produce muskets and/or rifles with interchangeable parts were:

(1) John H. Hall at Harpers Ferry, VA (c. 1824-26);
(2) Simeon North at Middletown, CT (c. 1831-32);
(3) Springfield National Armory (c. 1845-48);
(4) Harpers Ferry National Armory (c. 1845-50);
(5) Robbins & Lawrence, Windsor, Vermont (c. 1846-50).

But more about this later....

NOTEWORTHY POINTS IN "GUNSMITH OF WILLIAMSBURG":

--Type of firearms being made = flintlock rifle
--Method of manufacture = craft or handicraft method [1 master artisans and 1 apprentice].
--All major components of the rifle are made by hand methods except for the use of a rudimentary hand powered and controlled boring machine and a hand powered and controlled rifling machine. No water or steam power is used in the manufacturing process, no basic machine tools, and no precision measuring methods.
--Each rifle is a unique product that conforms only to the craftsman's general style and manner of work. No standardization or uniformity exists in such arms except in a stylistic sense. Worth pointing out that, today, early Pennsylvania-Kentucky and New England rifles can be identified by their decorative details and attributed to various makers and regional metalworking "cultures" from which they came.
--Over 300 hours of labor is required to make highly decorated firearms of this type. Lesser specimens required less time.